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WEBINAR



CompTIA Network+ N10-009 TTT Session 5:

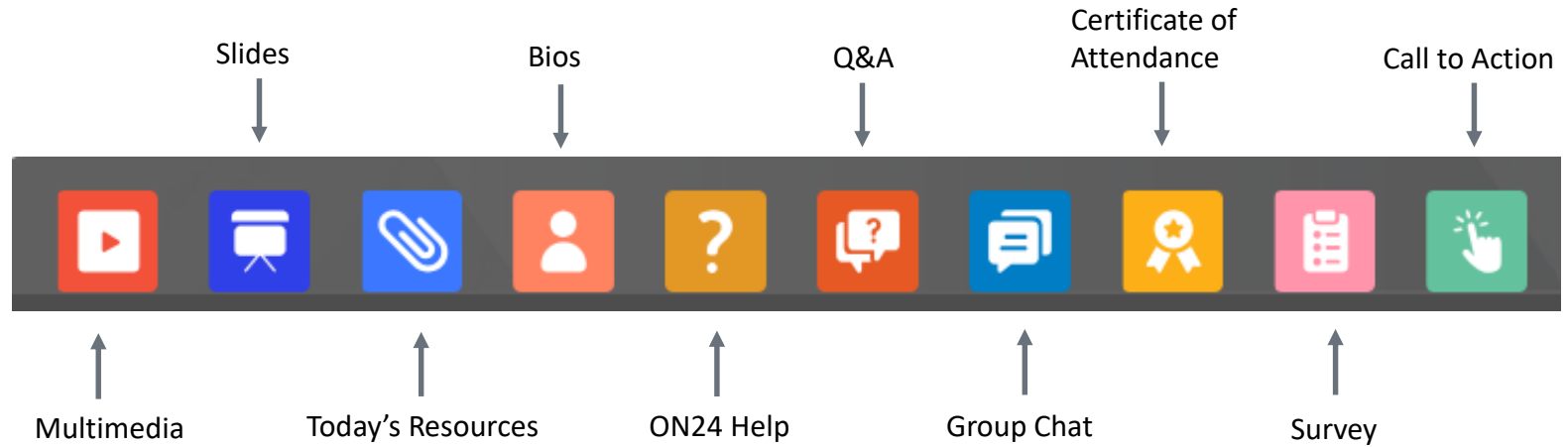
Title

July 09, 2024

CompTIA®



@TeachCompTIA #NetworkPlusTTT



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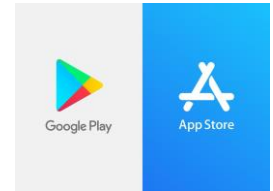
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Join us for the morning session from 9:00 a.m. to 12:00 p.m. or
the afternoon session from 1:00 p.m. to 4:00 p.m.

Each session is \$99.00.

Lunch and refreshments provided

Workshop sessions:

1. Get In Sync with the new CompTIA Tech+ FC0-U71
2. Teaching CompTIA Network+ N10-009 with the new CertMaster Perform
3. Tools for teaching CompTIA A+ 1100 Series

Each session provides:

- Access to official CompTIA content for the course
- Instructor led training and labs
- Certificate of completion provided at the end of session.

Hyatt Regency Atlanta

July 31 – August 1

Register today: <https://connect.comptia.org/partnersummit/home>



If a bad organizational culture eats ethics for breakfast, then will AI steal your lunch money?

What: One-hour webinar investigating current industry AI trends

When: Thursday July 25th 10:00 a.m. CST

Where: ON24

Who: James Stanger, Chief Technology Evangelist

Register: <https://bit.ly/CINPulse-AITrends>



@TeachCompTIA

Agenda



- Introductions
- Getting to know you
- Why Network+
- Session 1 topics

Network+ N10-009 TTT Session Outline

Date	Topic
✓ 06/20/2024	Introduction and Network Topologies
✓ 06/25/2024	Cabling and Physical Installations
✓ 06/27/2024	Configuring Interfaces and Switches
✓ 07/02/2024	Configuring Network Addressing
✓ 07/09/2024	Configuring Routing and Advanced Switching
07/11/2024	Network Security
07/16/2024	Network Security (Continued)
07/18/2024	Wireless Networking
07/23/2024	Troubleshooting and Management
07/25/2024	Emerging Technologies and Trends

CONFIGURING ROUTING AND ADVANCED SWITCHING



Learning Objectives



Compare and contrast routing concepts.



Compare and contrast dynamic routing concepts.



Install and troubleshoot routers.



Explain tiered switching architecture.



Explain virtual LANs.

ROUTING TECHNOLOGIES



Routing Tables and Path Selection

The following main parameters define a routing entry:



Protocol

Destination

Interface

Gateway/next hop

Static and Default Routes

Routing
table
entries

- Directly connected routes
- Remote routes
- Host routes
- Default route

Routing Table Example

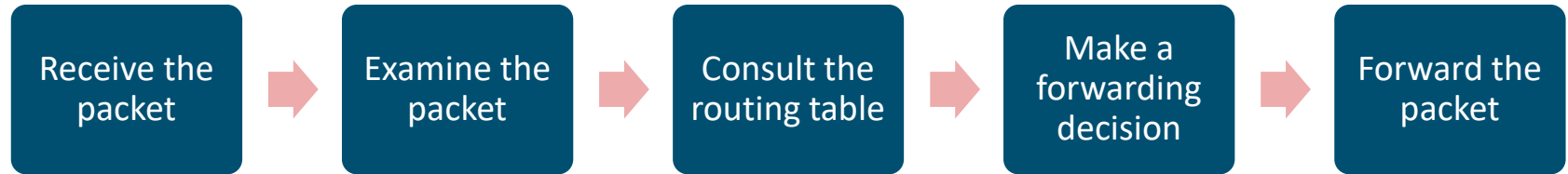
Router B Routing Table		
Network	Interface	Source
10.0.1.0/24	G0	Static
10.0.2.0/24	G0	Connected
10.0.3.0/24	G1	Connected
10.0.4.0/24	G1	Static



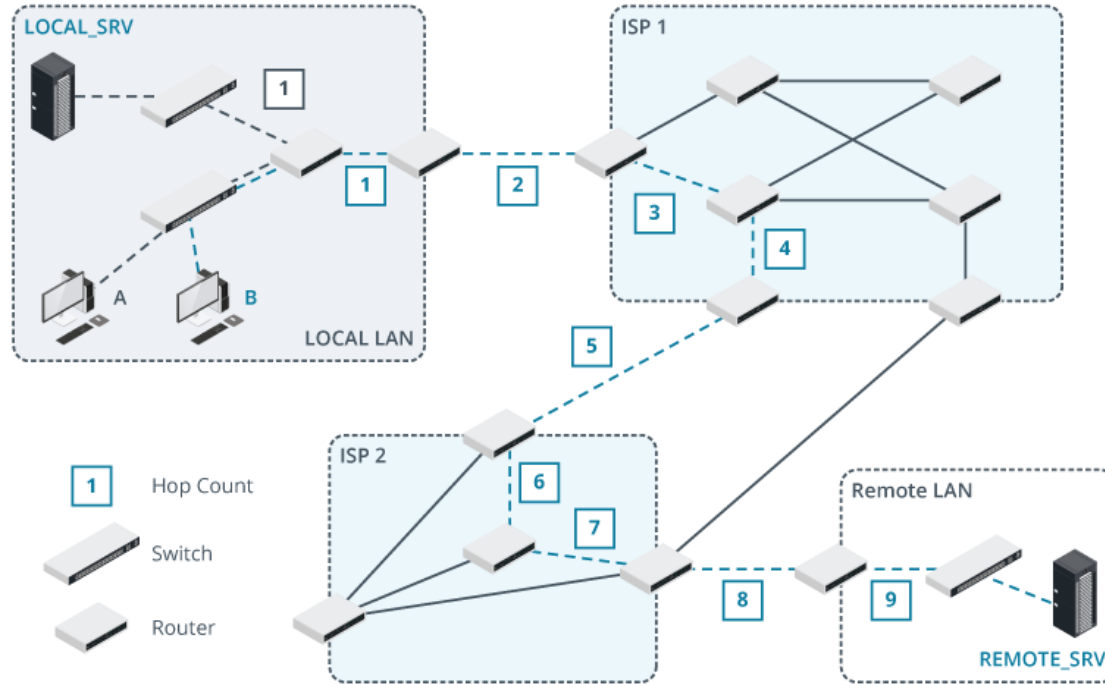
Router A Routing Table		
Network	Interface	Source
10.0.1.0/24	G0	Connected
10.0.2.0/24	G1	Connected
10.0.3.0/24	G1	Static
10.0.4.0/24	G1	Static

Router C Routing Table		
Network	Interface	Source
0.0.0.0/0	G0	Static
10.0.3.0/24	G0	Connected
10.0.4.0/24	G1	Connected

Packet Forwarding



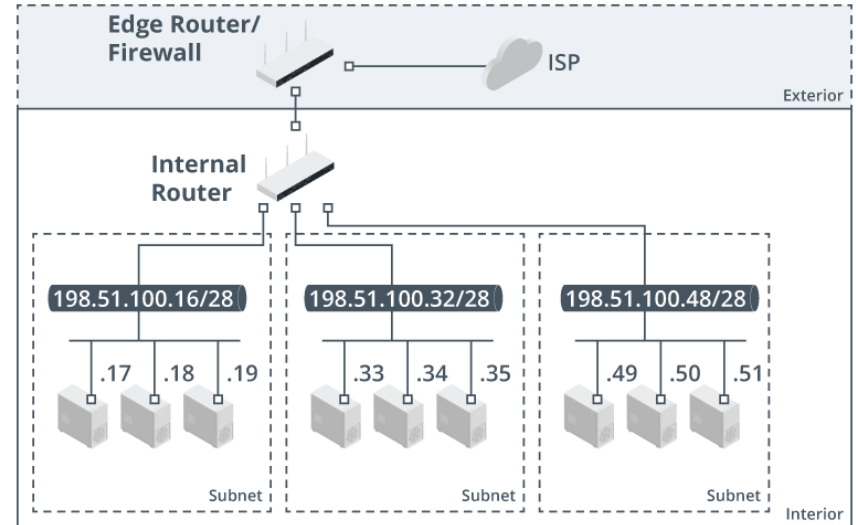
Hop Count



Router Configuration

Router placement:

- Same subnet or IP network must not be separated by a router
- Different subnets or IP networks must be separated by a router



Routing Tools

show route

Displays
routing table

show arp

Lists current
ARP table
entries

route

Shows IP
routing table
of a host

tracert

Tracks a
packet's path
to destination

Activity: Trivia



What is the function of a routing table?



What are directly connected routes?



What is traceroute used for?

DYNAMIC ROUTING TECHNOLOGIES



Static vs. Dynamic Routing

Feature	Static Routing	Dynamic Routing
Configuration	Manually configured	Automatically adjusts to network changes
Flexibility	Inflexible - Updates require manual intervention	Flexible - Adapts in real-time
Control	Complete control over routing paths	Less direct control over the routes that data takes
Use Case	Ideal for small, stable networks where routes do not change often	Ideal for larger, more complex networks with frequent changes

Dynamic Routing Protocols



Definition

Dynamic routing protocols are algorithms that automatically update route information and adjust the paths between network nodes by distributing network topology information.



Advantages

Scalability, adaptivity to network changes, and reduced network administration overhead



Considerations

Requires more processing power and memory
Proper configuration is critical for security and efficiency

RIP Protocol



Definition

A legacy dynamic routing protocol that finds the best path between the source and destination networks.



Features

Uses hop count as the metric for path selection
15 maximum allowed hops

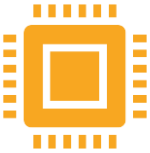


Considerations

Not ideal for large networks because of the hop count limit

Slow to converge in response to network changes

Enhanced IGRP (EIGRP)



Definition

An advanced distance-vector protocol that is used on a computer network for automating routing decisions and configurations



Features

Uses metrics such as bandwidth, delay, load, and reliability for path selection

Supports both IPv4 and IPv6 without needing separate configurations



Considerations

More complex to configure

Cisco Systems proprietary protocol

Open Shortest Path First (OSPF)



Definition

A dynamic link-state protocol that efficiently exchanges routing information within an autonomous system using the Shortest Path First algorithm.



Features

Computes the shortest path first
Supports complex network topologies



Considerations

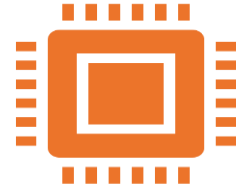
Can be complex planning and configuration
Requires more bandwidth than distance-vector protocols

Border Gateway Protocol (BGP)



Definition

Gateway protocol that enables the Internet to exchange routing information between autonomous systems.



Features

- Scalable to the Internet's size, handling thousands of routes
- Uses path vector protocol for establishing routing decisions
- Supports CIDR, allowing for efficient IP address management and route aggregation.

Activity: Fill in the Blank

1. _____ are algorithms that automatically update route information and adjust the paths between network nodes by distributing network topology information.
2. _____ is a protocol that enables the Internet to exchange routing information between autonomous systems.
3. _____ is a legacy dynamic routing protocol that finds the best path between the source and destination networks.
4. _____ is a dynamic link-state protocol that efficiently exchanges routing information within an autonomous system using the Shortest Path First algorithm.



NETWORK ADDRESS TRANSLATION



Network Address Translation (NAT)

What it does

Modifies the network address information in packet headers while in transit

Enables multiple devices on a local network to share a single public IP address

Why it is needed

Increases network security by hiding internal IP addresses from external networks

Conserves public IP addresses

NAT Types

Dynamic

Maps internal addresses to a pool of external addresses dynamically

Allows a larger number of devices to share the same external IP address

Static

Translates one internal IP address to one external IP address.

Allows inbound connections initiated from outside the network.

Edge Routers

An edge router

- Is located at the boundary of a network that connects to external networks (e.g., the Internet).
- Manages the flow of data between the internal and external networks.
- Routes data to its destination, performs NAT and applies security measures.

Types of Edge Routers

Customer Edge (CE)

Located at the edge of a customer's network

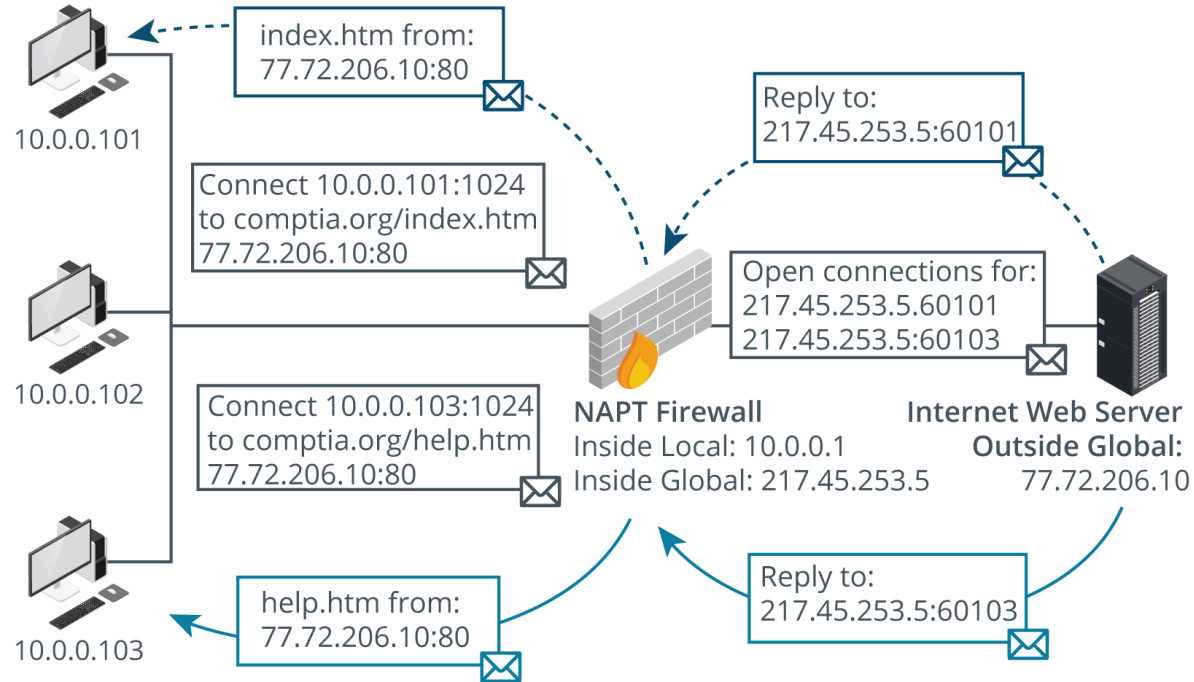
Connects customer's internal network to provider's network, acting as a security barrier for the customer's network

Provider's Edge (PE)

Located at the edge of a provider's network

Focuses on maintaining the integrity and confidentiality of customer data as it travels across the provider's network

Port Address Translation



Activity: Multiple Choice



Conserves public IP addresses

Maps internal addresses to a pool of external addresses

Maintains the confidentiality of a customer's data as it travels across the provider's network

NAT

PAT

Dynamic NAT

Static NAT

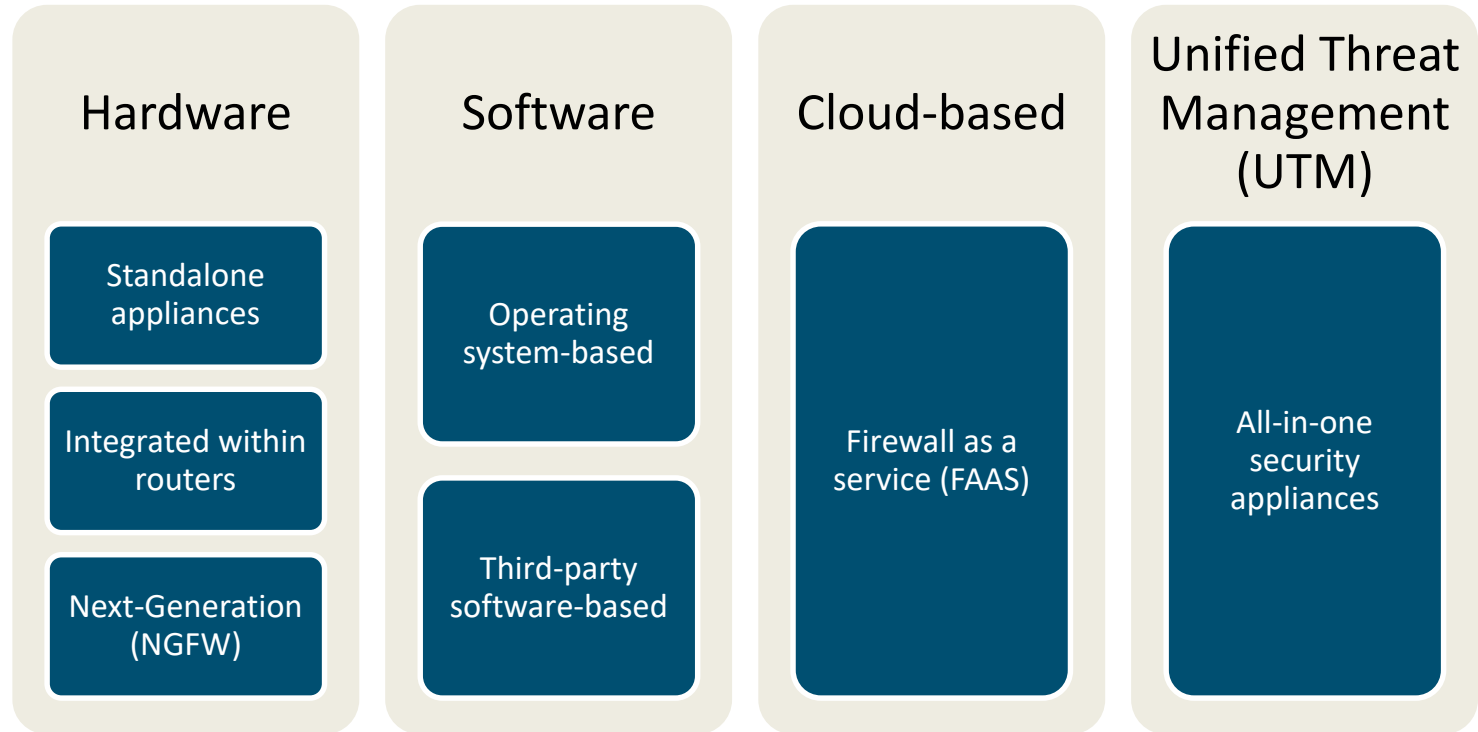
CE

PE

FIREWALLS



Firewall Types



Stateless vs. Stateful

Stateless inspection (Packet filtering)

Filters based on IP addresses,
protocol, and port numbers

Acts at the network layer

Suitable for smaller networks or
less complex security requirements

Stateful inspection (Circuit Level Gateway)

Inspects packets and tracks the
state of active connections

Acts at the session layer

Ideal for corporate networks where
it is critical to protect sensitive data

ENTERPRISE NETWORKING TOPOLOGIES

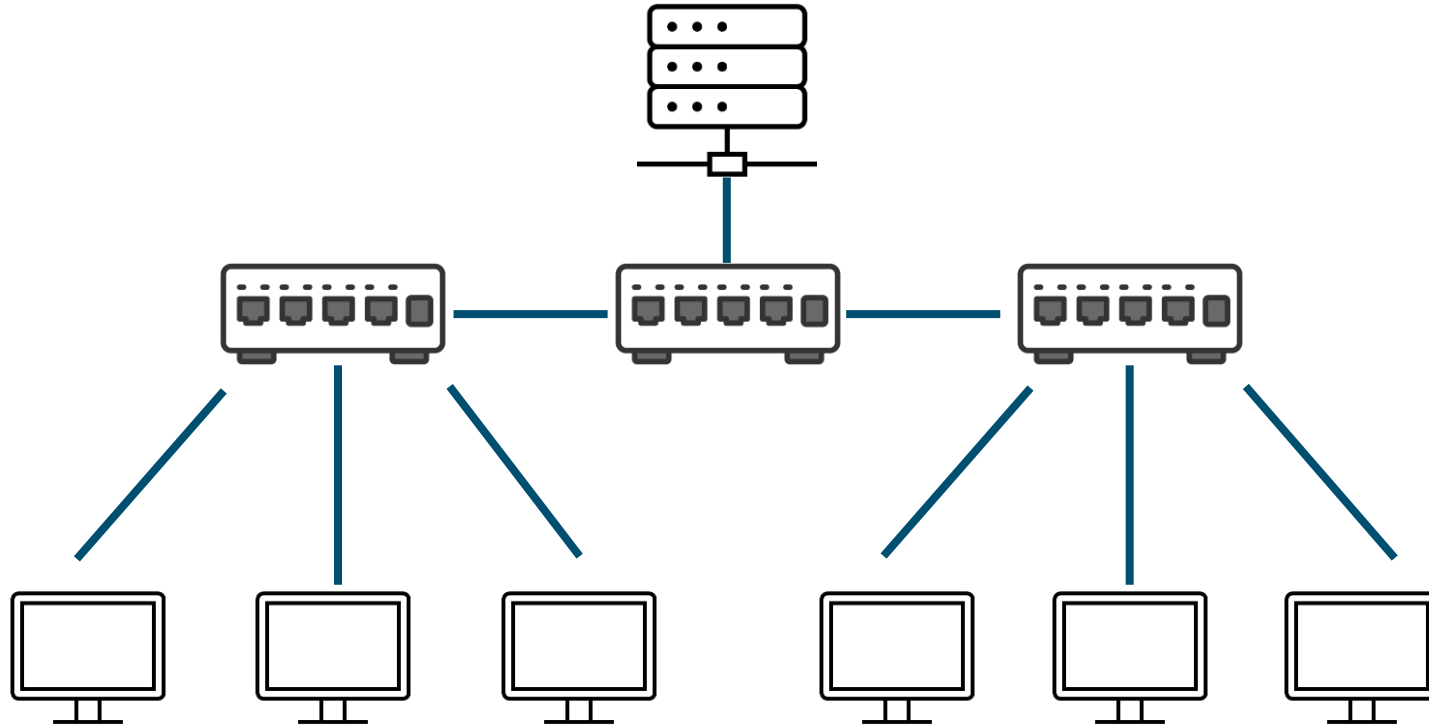


Activity: Think About It



What are the three basic network topologies?

Tree Topology



Hybrid Topologies

Hybrid Topologies

- Used when a basic topology isn't enough
- Use a mixture of the basic topologies
- Used to implement redundancy and fault tolerance

VIRTUAL LANS



Virtual LANs and Subnets

Creates separate networks within a single physical network infrastructure

Segmentation

- Divides a network into small, isolated segments
- Doesn't require separate hardware

Flexibility

- Users and devices are grouped by function, department or team

Simplified Administration

- Network changes or moves can be easily managed without altering physical setup

VLAN IDs and Membership

VLAN IDs

- Each VLAN is assigned a unique ID
- Each device is a member of a VLAN
- Devices use VLAN IDs to manage traffic
- Inter-VLAN routing is needed for devices to communicate between VLANs

Tagged and Untagged Ports

- Port tagging: method of marking data packets with a VLAN ID
- Tagged ports: configured to receive and understand packets that have a VLAN identifier
- Untagged ports: set to receive data without a VLAN identifier



VLAN Types

Default VLAN

- VLAN with ID1
- Should remain unused
- Change unused ports from ID1

Native VLAN

- Receives all untagged frames
- Separate Native and Default VLANs
- Match Native VLAN IDs on switches

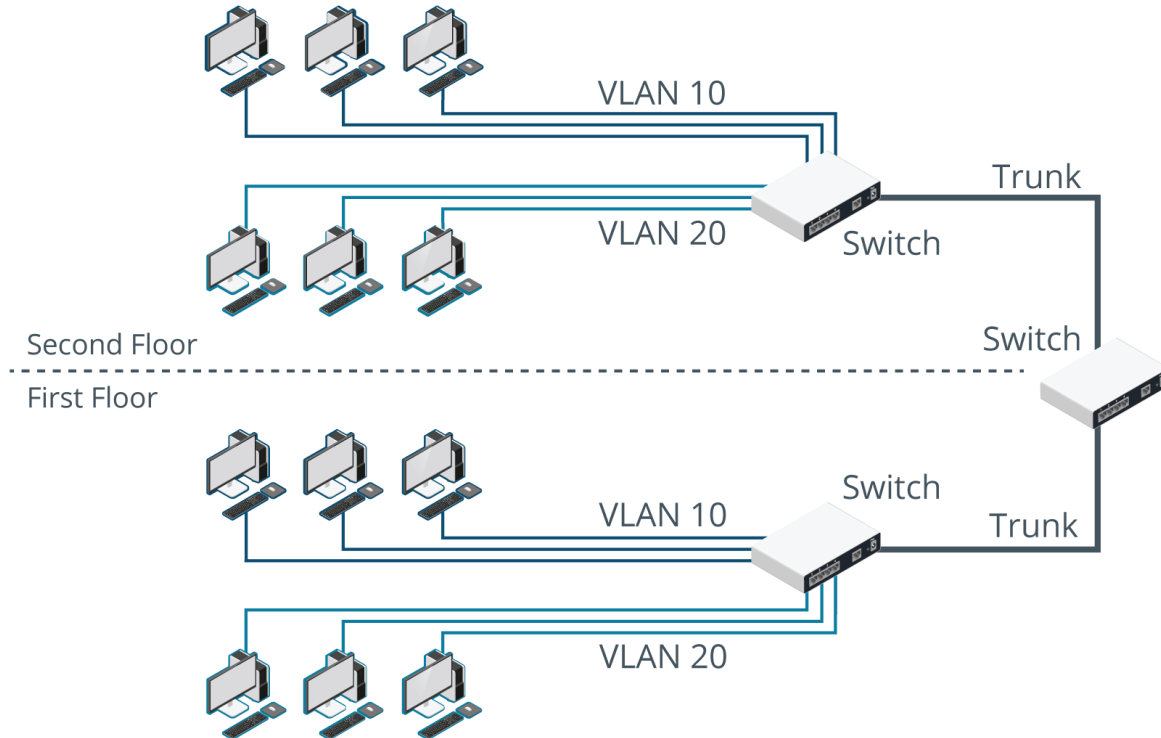
Voice VLAN

- Handles VoIP system traffic
- Ensures voice communication quality
- Prioritizes voice traffic

Management VLAN

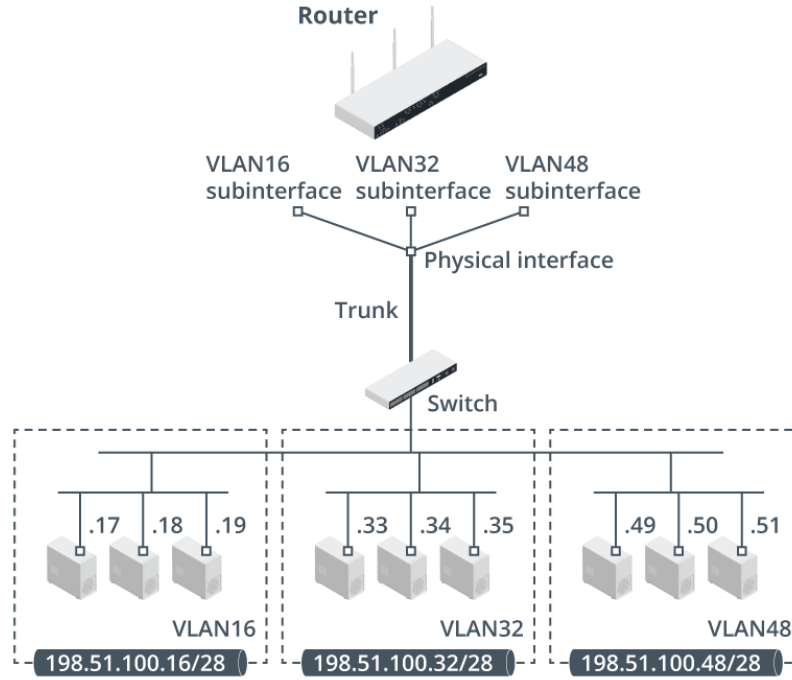
- Manages network devices and services
- Isolate from user data traffic
- Separate from Default VLAN

Trunking and IEEE



Trunking bundles physical links into one logical link

VLAN Routing



Activity: Two Truths and a Lie



Each device in a VLAN is assigned a unique VLAN ID.

Untagged ports are set to receive data without a VLAN identifier.

A Native VLAN receives all untagged frames.

ROUTING AND VLAN TROUBLESHOOTING



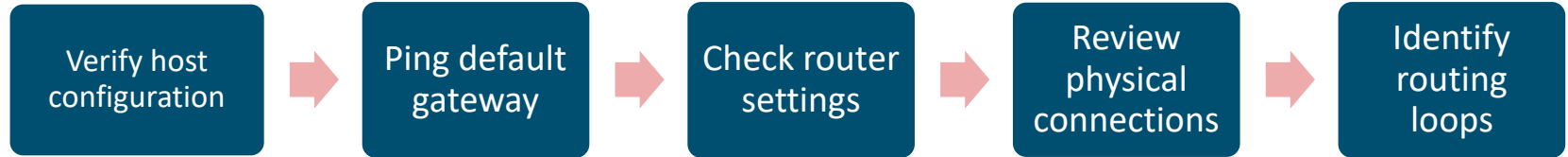
Routing Table Issues

Suspect a routing issue if you ping a host's default gateway but not some or all hosts on remote network.



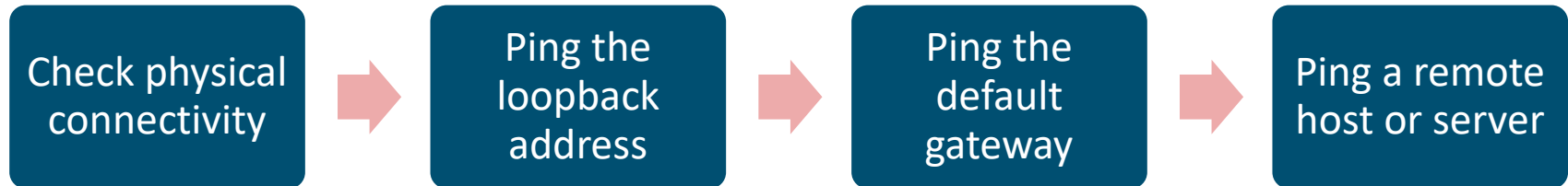
Default Route and Routing Loop Issues

Misconfigured default routes or distributing default routes to other routers can lead to routing loops.



VLAN Assignment Issues

Devices on a VLAN need a matching IP configuration (address, subnet mask, gateway, DNS).



Activity: Homework

- Research these hybrid topologies and note the following:
- What do they look like?
- How and when are they used?



Hierarchical star



Hierarchical star-mesh



Star of stars



3-Tiered network hierarchy

Summary

- **Routing Tables:** Routers' internal maps guide data packets to their destinations
- **Dynamic Routing:** Protocols automate routing information exchange between routers
- **NAT:** Translates between private and public IP addresses for internet access
- **VLANs:** Create logical network segments within a physical network

Discussion time: Please type your questions in chat

- Questions over content.
- Share you experience.
- What would you like to see different moving forward?

Thank You!



Let's keep the conversation going in the CompTIA Instructor Forum: <https://cin.comptia.org>